Roundup

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NASA STS114-S-048

NASA/Markowitz JSC2005E33434

Space Shuttle Discovery *glided to a gentle touchdown at Edwards Air Force Base in California at 7:11 a.m. CDT on Aug. 9. Weather concerns earlier that morning had caused the 'wave off' of two Kennedy Space Center landing opportunities. Commander Eileen Collins and Pilot Jim Kelly guided the ship as it made its 17,000 mph descent from space into the morning darkness.*

The STS-114 crew (left) watches from the podium during the crew return ceremony that took place at Ellington Field as JSC Center Director Jefferson D. Howell Jr. makes introductory remarks.

NASA ISS011E11074

Discovery comes full circle

On Day Three of the historic Return to Flight mission, *Discovery* Commander Eileen Collins guided the spacecraft through a backflip to allow photography of its heat shield. The photos were analyzed by engineers on the ground as additional data to evaluate the condition of *Discovery*'s heat-resistant ceramic tiles.

Explore. Discover. Understand.

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2005
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Space Center Roundup

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A MESSAGE FROM CENTER DIRECTOR LT. GEN. JEFFERSON D. HOWELL JR.

"The eyes of the world..."

NASA/Sanchez JSC2005E33499

Jefferson D. Howell Jr. speaks at the crew return celebration held at Ellington Air Force Base.

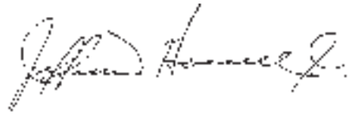
I hope my Aggie colleagues will forgive this small story. In the early 1900s the President of the University of Texas (UT), Col. William Prather, regularly reminded the then small student body of the university that "The eyes of Texas are upon you!" The colonel was altering a similar saying used by Robert E. Lee when Prather was a student at Washington College in Lexington, Va. He was trying to impress upon the students that being the few sons and daughters of the state attending UT, all of Texas was watching to see if they would succeed or squander their unique opportunity. His continual extolling about "The eyes of Texas are upon you!" led to the present familiar school song.

Last July millions of people around the world held their collective breath as *Discovery* roared into orbit, and again when it descended back to Mother Earth. The countless number of front-page articles in newspapers from all nations affirmed the incredible attention this mission and we, NASA, were attracting worldwide. The STS-114 experience should serve as a reminder to all of us that we and what we do, including our successes and failures, serve as a significant measuring stick to the rest of the world as to the greatness of our nation. Appropriate or not, that's the way it is. Indeed, "The eyes of the world are upon you!"

The crews flying in our spacecraft are rightfully the focal point of attention. However, when things go wrong, you and I get much of the spotlight when the "fault mongers" go on the attack. One might think it's not fair to be sliced and diced when the blame game gets under way. On the contrary, I believe the attention and criticism we receive is a sign of the extraordinary importance that our activities are perceived by all others.

Mistakes will always be made in any human enterprise, especially one as complex and difficult as human space exploration. However, if we strive to eliminate error to the best of our ability, and we continuously pursue mission success while maintaining our integrity and practicing professional excellence, we can face our critics with our heads held high.

How very special it is to be a part of this wonderful endeavor that has so much importance to our nation and the world! I have every confidence that you will excel as we go forward to fulfill the Vision for Space Exploration.



a letter

FROM THE STS-114 CREW

To the NASA family:

The entire STS-114 crew is happy to be back on Earth and back in Houston among our family and friends.

Our mission success was in large part due to the efforts of everyone here on the ground, at JSC and all the other NASA centers. We were well trained and prepared for the flight. *Discovery* performed up to every expectation and then some. We thank you for everything you did to get us ready and for the sacrifices you made over the past two-and-one-half years as NASA returned its Shuttle fleet to space.

It was a very special feeling as a Shuttle approached the International Space Station for the first time since *Endeavour*'s visit in November 2002. Sergei Krikalev and John Phillips were gracious hosts and worked diligently as we transferred equipment and supplies and enhanced the Station's operational fitness. *Discovery* set the stage for the missions that will follow as we complete construction of this great facility in space!

The Space Shuttle is a fabulous flying machine, and it has played an important role as we continue to explore space. In the next few years, even as Shuttles continue their valuable work in space, we will begin building the next-generation spacecraft to replace it. The Space Shuttle will always have a special place in our hearts. We are confident that the same talented people who build, maintain and manage the Space Shuttle and Space Station will be the ones who take us back to the Moon and on to Mars.

My entire crew was honored to fly this mission and represent NASA to America and the world. We know none of it would have been possible without you. You should be proud of the work you've done and continue to do for America's space program.

We are thankful for your hard work and dedication.

Eileen Collins, Commander
James Kelly, Pilot
Charlie Camarda, Mission Specialist
Wendy Lawrence, Mission Specialist
Steve Robinson, Mission Specialist
Andy Thomas, Mission Specialist
Soichi Noguchi, Mission Specialist, JAXA

NASA/Sanchez JSC2005E33332

The Space Shuttle Discovery *is pictured here docked to the Destiny laboratory of the International Space Station.*

NASA S114E6459

Discovery *mission a success*

The Space Shuttle *Discovery* is home after a 14-day, 5.8-million-mile journey in space. The mission included breathtaking in-orbit maneuvers, tests of new equipment and procedures, a first-of-its-kind spacewalking repair and virtual visits with two heads of state.

Commander Eileen Collins and the crew of the STS-114 mission, Jim Kelly, Charlie Camarda, Wendy Lawrence, Steve Robinson, Andy Thomas and Soichi Noguchi of Japan, landed at Edwards Air Force Base, Calif., at 7:11 a.m. CDT on Aug. 9.

"We have had a fantastic mission," Collins said shortly after the crew disembarked from the Shuttle. "We brought *Discovery* back in great shape. This is a wonderful moment for us all to experience."

Discovery's mission, the first of two Return to Flight test missions following the 2003 *Columbia* accident, was one of the most complex spaceflights in NASA history. The crew flawlessly executed its to-do list.

After an on-time liftoff from Kennedy Space Center on July 26, the crew tested new capabilities and techniques developed over the past two-and-one-half years to inspect and possibly repair the Space Shuttle in orbit. Collins guided *Discovery* through an unprecedented backflip maneuver as it approached the International Space Station. The maneuver allowed the Station crew to snap high-resolution photos that added to the wealth of new data mission managers used to ensure *Discovery* was in good shape to come home.

"It's going to be hard to top this mission," NASA Administrator Michael Griffin said. "Everywhere you look, there's nothing but outstanding success."

Robinson and Noguchi, with the help of crewmates, completed three spacewalks. The astronauts repaired one Space Station Control Moment Gyroscope and replaced another. Their efforts put all four of the Station's gyros back into service. They also tested new repair techniques for the Space Shuttle's heat-shielding outer skin and installed equipment outside the Station.

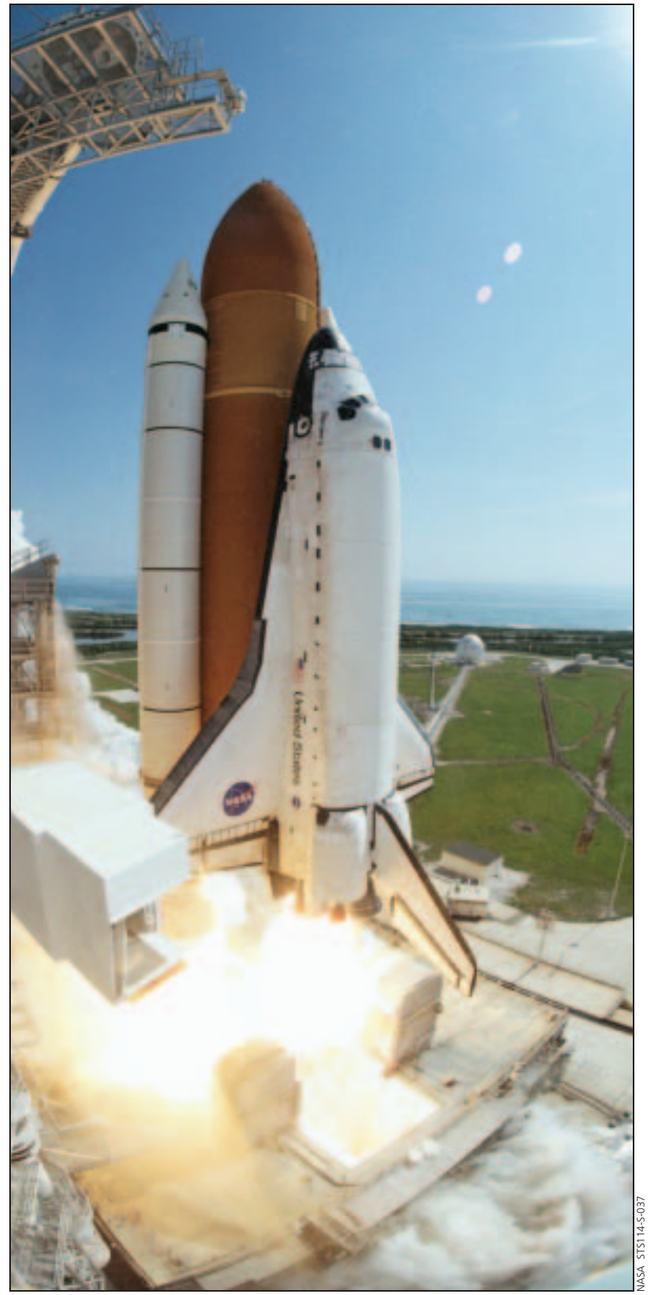
When two thermal protection tile gap fillers were spotted jutting out of *Discovery*'s underside, astronauts and other experts on the ground pulled together to devise a plan to prevent the protrusions from "tripping the boundary layer," causing higher temperatures on the Shuttle during atmospheric re-entry. Ground controllers sent up plans to the Shuttle-Station complex for Robinson to ride the Station robotic arm beneath the Shuttle and, with surgical precision, pluck out the gap fillers. Work on the Shuttle underbelly had never been tried before, but with Thomas coordinating, Lawrence and Kelly operating the robotic arms, and fellow spacewalker Noguchi keeping watch, Robinson delicately completed the extraction.

Discovery's astronauts and the Station crew, Russian Sergei Krikalev and American John Phillips, transferred more than 12,000 pounds of equipment and supplies to the Station. *Discovery* returned about 7,000 pounds of Station material to Earth.

The crew got phone calls from two world leaders. President George W. Bush and Japanese Prime Minister Junichiro Koizumi offered congratulations and appreciation for all the astronauts' hard work.

Commander Collins and the crew also paid tribute to the fallen astronauts of *Columbia*, as well as others who gave their lives for space exploration.

Over the next several weeks, engineers will process data from STS-114, the first of two test missions for the Space Shuttle. Teams are already at work looking into why a large piece of foam fell off the External Tank during ascent. NASA managers have committed to understanding why the foam came off the Tank and remedying it, if necessary, before clearing the next Space Shuttle Return to Flight test mission, STS-121, for flight.



NASA STS114-S-037

A tracking camera on Launch Pad 39B captures a close-up of Space Shuttle Discovery *moments after liftoff on the historic Return to Flight mission STS-114.*

STS-114 spacewalks

Astronaut Steve Robinson, STS-114 mission specialist, anchored to a foot restraint on the International Space Station's Canadarm2, participates in the mission's third session of extravehicular activity. The blackness of space and Earth's horizon form the backdrop for the image.

NASA S114E6642

The STS-114 crew performed three spacewalks while at the International Space Station. The crew tested techniques for repairing elements of the Space Shuttle's Thermal Protection System, replaced a Control Moment Gyroscope on the Station and installed an External Stowage Platform.

NASA S114E5979

Astronaut Soichi Noguchi, representing Japan Aerospace Exploration Agency (JAXA), waves at his spacewalking crewmate, Astronaut Steve Robinson, during EVA 2. Robinson can be seen in Noguchi's helmet visor using the new digital still camera outfitted for EVA exposure.

Extravehicular Activity 1

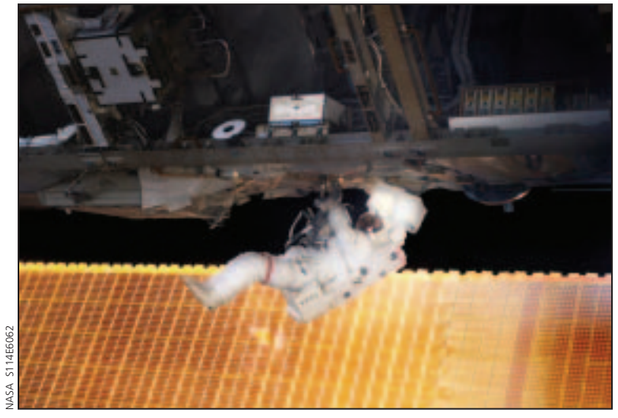
Soichi Noguchi, Steve Robinson
Flight Day 5
Start Time: 4:46 a.m. CDT, July 30
End Time: 11:36 a.m. CDT, July 30
Duration: six hours, 50 minutes

During the first extravehicular activity (EVA), the spacewalkers tested some new techniques for replacing or repairing damaged tiles on the Space Shuttle. For the repair demonstration, they worked with tiles and Reinforced Carbon-Carbon (RCC) intentionally damaged on the ground and brought into space in *Discovery*'s cargo bay. They tested an Emittance Wash Applicator for tile repair and Non-oxide Adhesive eXperimental (NOAX) for the RCC samples.

Extravehicular Activity 2

Soichi Noguchi, Steve Robinson
Flight Day 7
Start Time: 3:42 a.m. CDT, Aug. 1
End Time: 10:56 a.m. CDT, Aug. 1
Duration: seven hours, 14 minutes

The spacewalkers replaced a 600-pound gyroscope on the International Space Station, leaving the orbiting laboratory with a complete functional set of four. Called CMGs, the 600-pound devices maintain the Station's orientation in space, the way it is pointed and which part faces the Earth as it orbits the planet.



NASA S114E6062

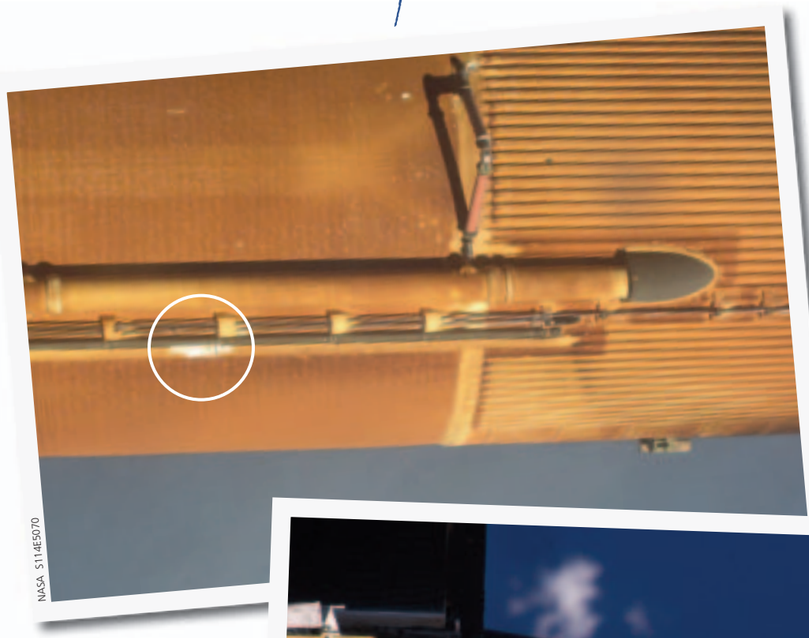
Noguchi participates in the mission's first scheduled session of extravehicular activity. Noguchi and Robinson (out of frame) completed a demonstration of Shuttle thermal protection repair techniques and enhancements to the International Space Station's attitude control system during the successful six-hour, 50-minute spacewalk.

Extravehicular Activity 3

Soichi Noguchi, Steve Robinson
Flight Day 9
Start Time: 3:48 a.m. CDT, Aug. 3
End Time: 9:49 a.m. CDT, Aug. 3
Duration: six hours, one minute

During the third spacewalk, Noguchi and Robinson installed and activated an External Stowage Platform on the Station's Quest Airlock. The platform is designed to hold Orbital Replacement Units that will be delivered to the Station in the future. Noguchi also installed another Materials International Space Station Experiment. Finally, Robinson rode the end of the Station's Canadarm2 to the underside of *Discovery* to remove gap fillers from between the orbiter's heat-shielding tiles.

The *mission* in *photos*



NASA S114E5070

This digital umbilical well image was taken after Discovery *separated from its external fuel tank following launch on July 26. Initial analysis showed a large piece of foam that separated from the tank during the Shuttle's ascent. The foam detached from an area of the tank called the Protuberance Air Load Ramp. The television view indicated the debris did not impact Discovery. In this still image, the area of missing foam (circled at left) on the tank is indicated by a light spot centered just below the liquid oxygen feedline.*

NASA ISS011E11023

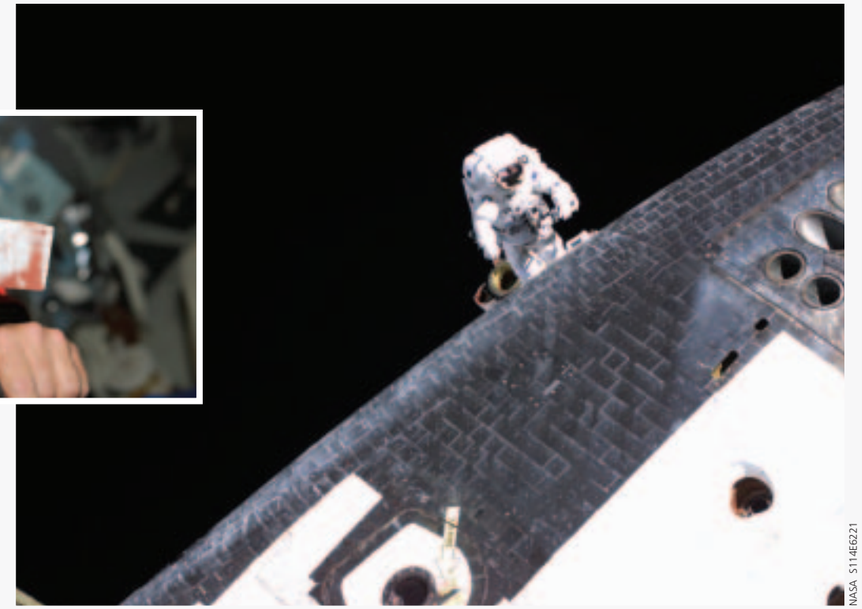
View of the Space Shuttle Discovery*'s crew cabin and the Orbiter Docking System, photographed as part of the survey sequence performed by the Expedition 11 crew during the STS-114 R-Bar Pitch Maneuver on Flight Day 3. A raised area of thermal blanket material (circled at right) can be seen just below a window on the commander's (port) side of the cabin.*

...I believe that we're a nation of explorers and immigrants...

NASA ISS011E11255

Space Shuttle Discovery *was about 600 feet from the International Space Station when Cosmonaut Sergei K. Krikalev, Expedition 11 commander, and Astronaut John Phillips, NASA Space Station science officer and flight engineer, photographed the spacecraft as it approached the Station and performed a backflip to allow photography of its heat shield. Astronaut Eileen Collins, STS-114 commander, guided the Shuttle through the flip. The Italian-built Raffaello Multi-Purpose Logistics Module is visible in the cargo bay.*

NASA S114E6674



NASA S114E6221

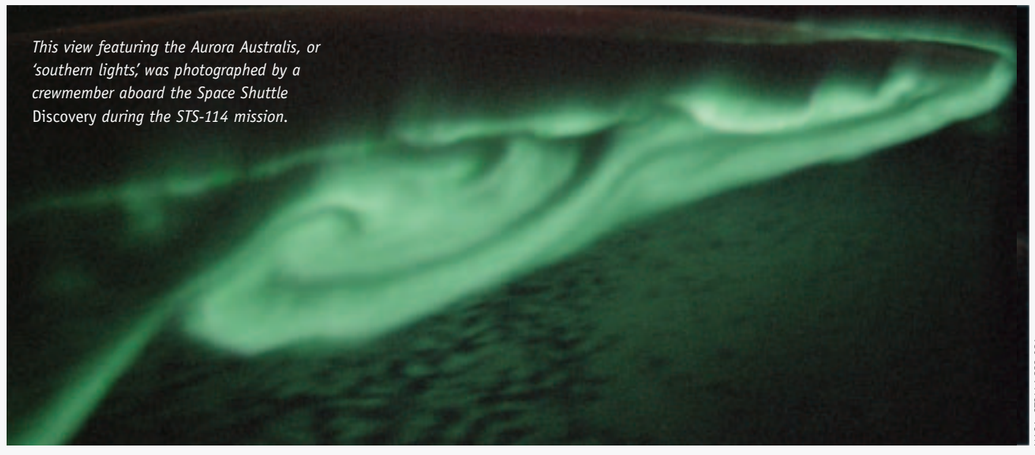
One of the STS-114 crew members holds a piece of the gap filler material (inset), which had been protruding from between Thermal Protection System tiles and which was retrieved during the third spacewalk of the flight by Mission Specialist Steve Robinson. Robinson (above) used his gloved fingers to pull out this gap filler and another one from Discovery*'s belly while carefully supported and maneuvered by the Canadian-built remote manipulator system, operated inside* Discovery*'s cabin by astronauts Wendy Lawrence and Jim Kelly.*

We are the kind of people who want to go out and learn new things and...take risks...

...calculated risks that are studied and understood. And I want to be part of that...

Astronaut Steve Robinson (left) and Japan Aerospace Exploration Agency (JAXA) Astronaut Soichi Noguchi, both STS-114 mission specialists, work in the Space Shuttle Discovery*'s cargo bay during the mission's first session of extravehicular activity while the Shuttle was docked to the International Space Station.*

NASA S114E6059



This view featuring the Aurora Australis, or 'southern lights,' was photographed by a crewmember aboard the Space Shuttle Discovery *during the STS-114 mission.*

NASA STS114-332-031

...because I think the benefits that we get from that...are very much worth the efforts.

STS-114 Commander Eileen Collins

NASA S114E7219

Backdropped against a colorful part of Earth, this full view of the International Space Station was photographed by a crewmember onboard the Space Shuttle Discovery *following the undocking of the two spacecraft.* Discovery *pulled away from the complex at 2:24 a.m. CDT on Aug. 6. Background area includes upper part of the Caspian Sea. The dark area on the lower right (near the Soyuz) is the Volga Delta.*

NASA STS114-S-045

The STS-114 crewmembers gather for a crew photo in front of the Space Shuttle Discovery *following landing at Edwards Air Force Base in California. From the left are astronauts Steve Robinson, mission specialist; Eileen Collins, commander; Andy Thomas, Wendy Lawrence, Soichi Noguchi representing Japan Aerospace Exploration Agency, Charlie Camarda, all mission specialists; and Jim Kelly, pilot.*

NASA EC05-01166-37

The Space Shuttle Discovery *hitched a ride on a special 747 carrier aircraft for the flight from California to the Kennedy Space Center, Fla., on Aug. 19.*

The many firsts of STS-114

Testing 1, 2, 3

During the first spacewalk on Flight Day 5, Spacewalkers Soichi Noguchi and Steve Robinson tested new techniques for replacing or repairing damaged tiles on the orbiter. For the repair demonstration, they worked with tiles and Reinforced Carbon-Carbon intentionally damaged on the ground and brought into space in *Discovery*'s cargo bay.

Removing the gap fillers: a spacewalking first

Robinson made a spacewalking first on Wednesday, Aug. 3, when he ventured underneath Space Shuttle *Discovery* to work on its heat shield. Riding the International Space Station's robotic arm, he carefully removed the gap fillers protruding from *Discovery*'s tiles.

Robinson's spacewalk to the underbelly of *Discovery* was the first to repair potential damage on a Space Shuttle orbiter in space.

First podcast from space

One day before landing, Robinson transmitted the first podcast from space.

Here is an excerpt from the transmission:

"Whether you support the space program or not, you're learning from it. You're learning from it the very moment you hear this and think about what we're doing. And I think that learning is what looking over the horizon is all about, and don't forget that learning can be exciting and fun, too, because that's certainly what this mission has been all about."

Discovery, roll over!

On Flight Day 3, Commander Eileen Collins flew the Shuttle through a slow backflip approximately 600 feet from the Space Station, allowing the underside of the Shuttle to face the Space Station. During that time, the Space Station crew snapped digital images using high-magnification lenses to document *Discovery*'s heat shield. This Rendezvous Pitch Maneuver was the first by a Shuttle during an approach for docking to the Space Station.

One of a series of photographs showing the Space Shuttle Discovery *as taken from aboard the International Space Station during rendezvous and docking operations. The Italian-built Raffaello Multi-Purpose Logistics Module is visible in the Shuttle's cargo bay. A docked Soyuz spacecraft, the Station's Canadarm2 and Quest Airlock are also visible.*

NASA ISS01E11238

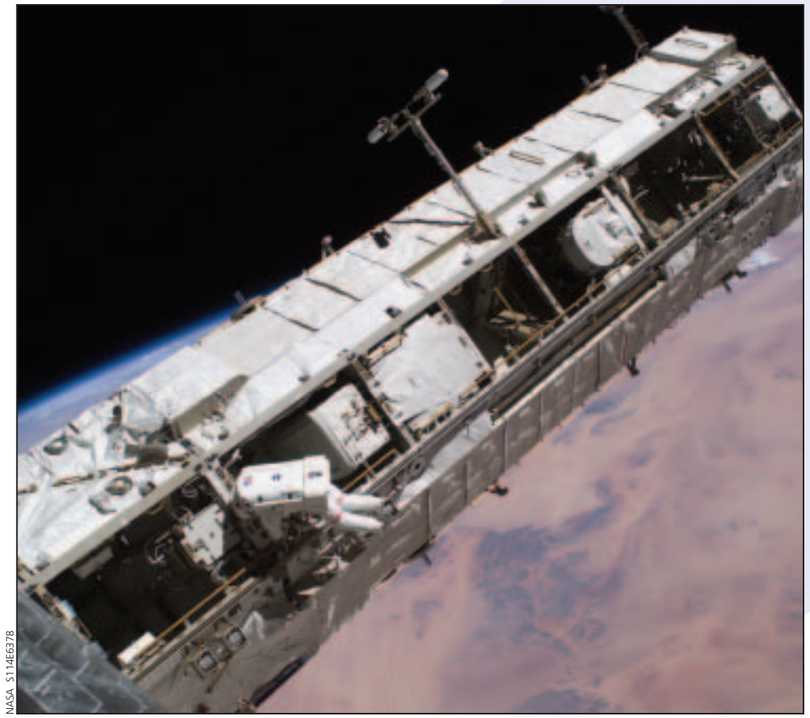
...I think that learning is what looking over the horizon is all about...

All eyes (and lenses) on *Discovery*

- STS-114 was the first Shuttle mission launched within a window designed to allow maximum daylight lighting conditions at Kennedy Space Center.
- *Discovery*'s climb to orbit was extensively documented through a system of new and upgraded ground-based cameras, radar systems and airborne cameras aboard high-altitude aircraft. The imagery captured of *Discovery*'s launch and during the mission helped managers determine the health of *Discovery*'s Thermal Protection System prior to landing. Moments after main engine cutoff, Mission Specialists Noguchi and Andy Thomas used handheld video and digital still cameras to document the external tank after it separated from the Shuttle.
- STS-114 debuted the Orbiter Boom Sensor System (OBSS). The OBSS is a 100-foot-long robotic arm used to inspect critical heat shield areas. The boom is tipped with two types of lasers and a high-resolution television camera.

Sensing a change

Another safety improvement making its first appearance during STS-114 was the Wing Leading Edge Impact Detection System, which will be used for all future Space Shuttle missions. The system includes accelerometers that monitor the orbiter's wings for debris impacts during launch and while in orbit. There are 22 temperature sensors and 66 accelerometers on each wing.



NASA S114E6378

While perched on a Space Station truss, Astronaut Soichi Noguchi, STS-114 mission specialist representing Japan Aerospace Exploration Agency, acts as observer and communication relay station between fellow spacewalker Steve Robinson (out of frame) and Astronaut Andy Thomas aboard Space Shuttle Discovery *during a part of the mission's third session of extravehicular activities. A portion of the thermal protection tiles on* Discovery*'s underside is visible at lower left.*

NASA ISS011E11125

TRIBUTE

THE CREWS OF STS-114 AND EXPEDITION 11

took a few moments, in the early morning hours of Aug. 4, to honor their friends, colleagues and heroes who had lost their lives in the pursuit of space exploration. Members of the combined crew took turns reading passages of a tribute as they orbited more than 200 miles above the Earth. Parts of the statement were repeated in Japanese and in Russian. Below are several excerpts from the tribute.

EXPLORATION: THE FIRE OF THE HUMAN SPIRIT
A TRIBUTE TO FALLEN ASTRONAUTS AND COSMONAUTS

Those who dare to venture into an unexplored land will have revealed to them things which were never known.
Those who venture out upon the sea will have revealed to them things never heard.
But those who venture into the sky upon wings of silence,
Yes, the ethereal adventurers,
Theirs is the revelation of things never dreamed!
Such are the ways of explorers
And the surpassing way of the sky. …

The spirit of exploration is truly part of what it is to be human. Human history has been a continual struggle from darkness toward light, a search for knowledge and deeper understanding, a search for truth. Ever since our distant ancestors ventured forth into the world, there has been an insatiable curiosity to see what lies beyond the next hill, what lies beyond the horizon. That is the fire of the human spirit that we all carry.

Through that spirit and through realizing its ambitions, the human race has come to find its present place in the world. Previous generations went first on foot, then on horseback. Later came the wooden sailing vessels that opened new continents and new lands. Today we have aircraft and spacecraft. We have shrunk the world in a way that early generations of explorers could never have imagined.

Likewise, even if the future is equally unimaginable to us, we can be sure that future generations will look upon our endeavors in space as we look upon those early expeditions across the seas. To those generations, the need to explore space will be as self evident as the need previous generations felt to explore the Earth and the seas. …

To the crew of *Columbia*, as well as the crews of *Challenger*, *Apollo* 1 and *Soyuz* 1 and 11, and to those who have courageously given so much, we now offer our enduring thanks. From you, we will carry the human spirit out into space, and we will continue the explorations you have begun. We will find those new harbors that lie out in the stars and of which you dreamed. …

They shall not grow old, as we that are left grow old:
Age shall not weary them, nor the years condemn.
At the going down of the sun and in the morning
We will remember them.